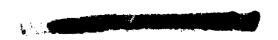


# P&W / GE PROPULSION SYSTEMS STUDIES INTRODUCTION

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## P&W / GE HSCT COLLABORATION JOINT PROPULSION STUDIES

Before P&W and GE present the results of our NASA engine study tasks, we will present a brief introduction covering our joint study organizations; the engine concepts we are studying; the groundrules we have defined for our studies; our engine evaluation criteria; our study plans; and the range of NASA study tasks.

- ORGANIZATIONS
- ENGINE CONCEPTS
- GROUND RULES
- ENGINE EVALUATION CRITERIA
- STUDY PLANS/MILESTONES
- NASA STUDY TASKS

## P&W / GE HSCT COLLABORATION PARALLEL TECHNICAL ORGANIZATION

The P&W/GE joint venture is a cooperative program organization made up of various functional organizations from both companies. These technical organizations have defined joint plans and common groundrules, and are now undertaking the technical tasks required in each technical discipline associated with the engine studies.

- TECHNICAL DISCIPLINES WORKING TOGETHER ON:
  - JOINT PLANS
  - COMMON GROUND RULES
  - TECHNICAL TASKS

### **HSCT ENGINE CONCEPTS**

In an effort to maximize the benefits of our joint efforts, and minimize duplication, P&W and GE decided to pursue those engine concepts that we each had the most knowledge about, and choosing just one common engine concept, the mixed flow turbofan, to be pursued by each company.

### P&W

- TURBINE BYPASS ENGINE
- MIXED FLOW TURBOFAN
- TURBINE BYPASS ENGINE WITH INLET FLOW VALVE

### GE

- MIXED FLOW TURBOFAN
- VARIABLE CYCLE ENGINE
- FLADE

# ENGINE CYCLE / DESIGN GROUND RULES 2005 ENTRY INTO SERVICE

P&W and GE have defined a common set of groundrules to be used in the engine studies. These groundrules are based on 2005 entry into service. These groundrules will be used to perform our joint engine studies leading to engine concept selection. The groundrules will be periodically reviewed and adjusted based on airframe company requirements and technology development.

AIRFLOW SIZE 650 LB/SEC THRUST CLASS 50-60,000 LB

MACH NUMBER 2.4

CYCLE TEMPERATURES 2900°F MAX T<sub>41</sub>

1250°F MAX T<sub>3</sub>

COMPONENT EFFICIENCY LATE '90's TECHNOLOGY AVAIL.

MATERIALS LATE '90's TECHNOLOGY AVAIL.

COMMERCIAL LIFE 18,000 HRS/9,000 CYCLES COLD SECTION

9,000 HRS/4,500 CYCLES HOT SECTION

### **ENGINE EVALUATION CRITERIA**

As we perform our engine studies leading to engine concept selection, it is important to define the evaluation criteria to be used to select an engine concept. P&W and GE are in the process of defining the criteria and then making sure we are addressing the critical areas to meet the criteria identified.

- PERFORMANCE
- WEIGHT
- PRICE
- MAINTENANCE COST
- RELIABILITY
- EMISSIONS
- NOISE
- AIRCRAFT MANUFACTURER ASSESSMENT
- IN-HOUSE MISSION EVALUATION
- COMPLEXITY / RISK ASSESSMENT

### 1991 HSCT SYSTEM STUDIES PLAN

The 1991 HSCT systems studies plan covers the total P&W and GE planned IR&D and NASA contract engine studies. We will be reviewing our NASA contract studies which are presently being performed as well as the results from recently completed NASA studies.

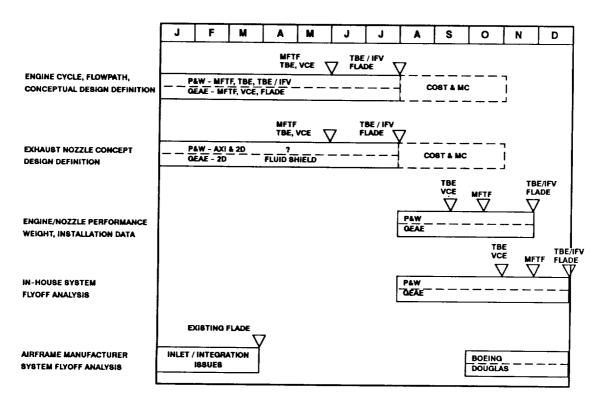


Figure 6

### **P&W NASA STUDY TASKS**

There are three NASA study engine tasks presently being performed by P&W. They are:

- 1. An engine life study evaluating the impact of the severe engine environment associated with the HSCT mission.
- 2. Definition of a mixed flow turbofan engine.
- 3. Conceptual design and evaluation of an axisymmetric exhaust nozzle vs. a 2D exhaust nozzle.

- MACH 2.4 TURBINE BYPASS ENGINE (TBE) LIFE STUDY
- MACH 2.4 MIXED FLOW TURBOFAN (MFTF) STUDY
- AXISYMMETRIC VERSUS 2D NOZZLE CONCEPTUAL DESIGN

### **GE NASA STUDY TASKS**

Present NASA engine studies being performed by GE cover a wide range of tasks from engine definitions; engine cycles and flowpaths; to exhaust nozzle mechanical design; and combustion efficiency trades.

- UPDATE M2.4 VCE CYCLE & FLOWPATH
- M2.4 FLADE CYCLE & FLOWPATH
- M2.4 TURBOJETS CYCLE & FLOWPATH
- EXHAUST NOZZLE TRADES
- MIXED FLOW TURBOFAN
- M2.4 FLADE NOZZLE MECHANICAL DESIGN
- COMBUSTOR EFFICIENCY TRADE
- M1.6 VCE CYCLE & FLOWPATH

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